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ADP010968

TITLE: The Obsolescence Management Based on a "Pro-Active" Approach
in Conjunction with a "Pre-Planned" Technology Insertion Route

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TITLE: Strategies to Mitigate Obsolescence in Defense Systems Using
Commercial Components [Strategies visant a atténuer l'obsolescence des
systemes par l'emploi de composants du commerce]

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ADP010960 thru ADP010986

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The Obsolescence Management Based on a “Pro-Active” Approach in Conjunction with a “Pre-Planned” Technology Insertion Route

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Summary

Parts obsolescence was affecting all Alenia products / programs so that we had to identify a robust strategy to prevent uncontrolled effects.

The design of products family has taken the obsolescence management issue as key, basic, requirement.

The basic ideas on the back of our pro-active approach for obsolescence issues are:

- ⇒ All products (in terms of equipment , subsystem or systems) design shall offers a flexible , open architettura which permits to change a specific functional block maintaining unchanged the overall architecture.
- ⇒ The “Open architecture” used shall facilitate any design changes into the defined functional blocks (caused by obsolescence issues) because of the high level of interface standardization.
- ⇒ A product configuration for a pre-determined period of time shall be maintained by performing components buy for all expected production batches including logistic support, allowance and spares.
- ⇒ There will be a defined periodic Product enhancement which permit a pre-planned obsolescence removal activities and relevant design changes.
- ⇒ There will be an high level of backward compatibility between the updated system configuration and the previous one.
- ⇒ Technologies which support the Product enhancement will be consolidated and introduced at a point where the level of risk is considered acceptable (or obsolescence became a major issue).
- ⇒ There will be a “synchronised technology insertion route” defined in the frame of the Company strategies which takes into account Customers requirement and market trend.
- ⇒ The obsolescence removal activity can’t be “just in case” but need to be anticipated and synchronized with a new technology insertion phase and or a step for a product enhancement.
- ⇒ There is an absolute need for a company organization capable of provide continuos market survey so that any corrective action can be taken on time for a minor changes or a major, synchronised product upgrade change.

BACKGROUND

Business and Products

Alenia Difesa UBSA is a branch of Finmeccanica (the major Italian company in the high-tech business) in charge of developing , producing and maintaining electronic equipments , subsystems and systems to be installed on fixed and rotary wings aircraft.

Since 60's it is present in this business area having participated to the major European programs such as the Tornado and Eurofighter aircraft, the EH101 and NH90 helicopters .

The Alenia Difesa UBSA main products consist of Mission and Navigation computers, including the relevant Operational Flight Programs, Displays (Head-Up, Head-Down, Helmet) and all simulation and integration support systems required for development and maintenance of the on-board avionic systems.

Introduction

- Obsolescence is an industry wide problem: it is in general not new, however, the rate of component obsolescence is increasing rapidly since the beginning of the nineties.
- Military component manufacturers are consolidating and withdrawing as the world market reduces. The reasons for this development are to be found in the geopolitical changes of the nineties and the Perry Initiative. In 1992 over 72.000 Military devices were available - by 1998 this figure was 38.000, which means that approximately 50% of the active semiconductor devices available at the beginning of the program development phase could be discontinued by the industry.
- As the specification of standard components increases, the requirement for military components decreases. Today the market share for military semiconductors is less that 0.7% compared to 17 % in 1976 and 7.5% in 1986. The market situation of 1997 has become worse, and further manufacturers have discontinued their military production lines. .
- Component production live cycles are much shorter than the supported lives of military products.

Whereas the system life cycle of a military aircraft is over 50 years with clearly increasing tendency over the last decades (as shown in the table below),

Aircraft	In service since	Phase out (projected)	Useful life¹
F15	1975	2010+	35 years
F14	1973	2010+	37 Years
F4	1972	2010	38 years
UH1	1959	2004	45 years
Tornado	1978	2030	52 years
KC 135	1957	2017	60 years
B52	1955	2040	85 years
EF2000	2001	-	-

the introduction rate for new microprocessors today is two years and new memory families are introduced at a rate of less than one year.

Moreover the introduction of new logic families with lower supply voltages will result in the obsolescence of the entire 5V technology within the next 5 years.

¹ These figures do not include the development phases of the A/C which also tend to increase considerably during the past decades

Definitions and abbreviations

<i>Obsolete</i>	A component which is no longer manufactured.
<i>Obsolescent</i>	A component which is declared to become obsolete by the manufacturer
<i>Potential Obsolescence</i>	The fact that components may still be active, however obsolescence is expected in the near future
<i>Obsolescence</i>	The process of becoming obsolete
<i>Last Time Buy</i>	Components procured to secure a series production or support programme after manufacturer has notified the end of production.
<i>Life Time Buy</i>	Purchase of the quantity of components predicted to be required for a defined period. Mainly used for risk items such as ASICs, connectors, memories, processors, etc.
<i>Bulk Obsolescence</i>	A large number of complex semiconductor and microcircuit devices on one SRI have become obsolete.
<i>Life Cycle Code</i>	Each active device have assigned a Life Cycle Code (ranging from 1 to 5) as follows: <ol style="list-style-type: none"> 1. Introduction The component (and relevant technology) has just been introduced 2. Growth The component (and relevant technology) has established a market position 3. Maturity The component (and relevant technology) has become industry standard 4. Decline The component (and relevant technology) is obsolescent and the probability of a manufacturer notification to become obsolete is very high 5. Phase out The component and relevant technology is obsolete
<i>Tranche</i>	Specified quantity of “product” (LRU/SRU) to be produced during a specific period of time

Abbreviations

A/C	=	Aircraft
ASIC	=	Application Specific Integrated Circuit
BoM	=	Bill of Material
DRL	=	Data Requirements List
EAPF	=	Engineering Alteration Proposal Form
ECR	=	Engineering Change Request
EF	=	Eurofighter
FFF	=	Form, Fit and Function
FMECA	=	Failure Modes Effects and Criticality Analysis
HW	=	HardWare
LCC	=	Life Cycle Code
LRI/U	=	Line Replaceable Item/Unit
LSA	=	Logistic Support Analysis
MTBD	=	Mean Time Between Defect
MTBF	=	Mean time Between Failure
OC	=	Obsolete Component(s)
OMP	=	Obsolescence Management Plan
PCB	=	Printed Circuit Board
PI	=	Production Investment
QML	=	Qualified Manufacturer List
QPL	=	Qualified Product List
RFQ	=	Request for Quotation
SP	=	Series Production
SRI	=	Shop Replaceable Item
STTE	=	Standard to Type Test Equipment
SW	=	SoftWare

Strategies

A Brief overview

Parts obsolescence was affecting all Alenia products / programs so that we had to identify a robust strategy to prevent uncontrolled effects.

First , we had to establish a company organization (Human resources , methodologies and tools) able to support a market survey activity , to provide an early warning information to the project/program management team , in order to decide a “cure” or a “corrective” action (i.e. design change, last time buy ...).

Second, we have to live together with different products:

“old” products , still in production

“new” products , in development .

Old products

We were not in position to change “drammatically” their architecture.

Consequently we were only able to monitor the market and to apply the corrective actions when obsolescence issue arise (i.e. design changes “just in case” several last time buy for the batches still to be produced) by adopting the specific company organization and processes.

We considered this case as purely “passive” approach.

New Products

We have had the opportunity of “new” programs for which we had to build a completely new product family.

At the beginning we have performed a market analysis looking at the COTS (Commercial Of The Shelf) vendors of electronic modules/equipments (i.e. processor modules, chassis ...).

Initially use of COTS provided SRIs have been considered as a good option to manage obsolescence but, later on, we have decided to design our own product families since:

- the vendors of COTS modules meet with the same obsolescence problem,
- we are not in a position to control their products evolution because they are driven by different market (i.e. the commercial market),
- our system shall offer some specific capability (environment , performance) not available as COTS on the market,
- COTS module binding us on the “third” party for our business.

The design of such “new” products family has taken the obsolescence management issue as key, basic, requirement. We have been in position to establish a “pro-active” approach also considering that the parts obsolescence problem cannot be resolved once and for all: *sooner or later some parts became obsolete.*

Having in mind the products life cycle, we focused our attention on the fact that all products are affected by periodic upgrades, at least for the following basic reasons :

- it has to offer the best trade off between price and performance
- it has to follow the technology improvement trend and the relevant market

Products families

On the base of our previous experience, we have designed a state of the art product families based on:

- advanced design criteria (latest technology, software development tools,..)
- open architecture concepts with the adoption of “COTS” device families

that gives the most effective benefits with respect to the obsolescence issues.

Open architecture

Our basic view is that obsolescence can be controlled properly being capable of porting old technology into a new one by defining an Open Architecture on which the core components are under our direct control (Alenia design) or are managed with an adequate level of supplier commitment (key suppliers are involved directly in the Alenia Difesa product strategy).

We also have defined a deep level of functional standardization (HW & SW) which permits an easy, localized and well controlled (low risk) modification, in case obsolescence occurs.

Several definitions and solutions are applicable in realising so-called *Open Architecture*.

In defining our “interpretation” we have considered the following guidelines as “Basic” design requirement:

- the system architecture shall be modular and scalable
- it has to be based on the most diffused global and local HW interfaces
- it has to be logically organised in “layers” so that all the interfaces between different layers (HW & SW) shall be clearly identified
- the HW & SW layers shall have “standard” interfaces, where standard means
- “most diffused and supported on the market”

Therefore we have organized our open architecture by “clearly identify” the following :

a) functional blocks, over standardized local bus architectures:

the system architecture has been divided into functional blocks to make the HW layering easily interfaceable by the SW layers.

b) local bus networks:

PCI communication bus has been selected as it is the most suitable in terms of market availability and support (having dominant and recognised position in PC architectures) as well as it is offering optimal performance

c) global bus networks:

VME communication bus has been selected as the most suitable in terms of market availability and support also offering optimal performance

d) logical & physical interfaces (HW):

Using PCI and VME buses it has been possible to define FPGA/ASIC based communication “bridges” between functional blocks.

Logical protocol to have access on both sides of each functional block have been defined and standardised.

The functional block can be composed of discrete devices as well as contained into a single VLSI device (i.e. Hybrid, ASIC, FPGA)

e) API (Application SW to Basic Software) interfaces:

Our experience has demonstrated that software packages* development and certification in military systems, costs significantly more than hardware development and re-certification.

Therefore key target was to minimize impact of obsolescence on the software side by defining :

- a) a robust , well proven, basic software to operational software logical interface, based on COTS operating systems .
- b) a standard COTS OFF SW factories (i.e. VPI VAPS for graphics , ADA for OFF) .

*(Basic and Operational Software)

Design criteria

1. The Industrial Grade components quality level is largely used in all the Alenia Difesa modules . This increase the equivalent (pin to pin) component choices.
2. The HW modules have been designed with the key requirement of technology rationalisation (reduced amount of connector families , reduced set of device types..)
3. Modular approach to the sub-module has been encouraged to increase HW interface robustness.
4. Packaging optimisation has been performed
5. Rationalisation of component types and packages has been defined
6. Topology optimisation has been identified (specially for analog power design)

COTS devices in Alenia products

In designing Alenia products we have identified two different critical levels of devices:

- a) Key Components : all those components for which remove obsolescence means larger HW re-design with significant impact on the SW (both Basic SW and Operational Flight Programs) already developed and certified.
- b) Low Level Components : all those components for which remove obsolescence results in a “slight” HW modification possibly without impact on the existing SW

Key components have been selected considering the following factors :

- must be available inside the commercial market
- must have multiple suppliers
- shall comply with the most popular backplane buses or std interfaces
- shall be available at least in the “industrial quality level”

We have classified as Key Components :

- a) **Processors** : specific contract have been defined with the main Processor suppliers (i.e. Thomson , Analog Devices...) in order to be guaranteed about component deliveries for all the Alenia Difesa programs.
- b) **ASICs / FPGA** : this components have been developed in the VHDL language. This permit an easy “migration” of the embedded functions from an old technology to a new one supporting (if required) component replacement.
- c) **CPLD / PLD / PAL** : this components have been programmed through a dedicated tools widely used on the market. This permit an easy “migration” from an old component technology to a new one.
- d) **HYBRIDS** : specific contract have been defined with the main suppliers in order to be guaranteed about component deliveries for Alenia Difesa programs.
- e) **RAM , EPROM , EEPROM** : We have identified as much as possible most diffused components on the market taking into account those devices with more that two sources and any potential growth in terms of addressing capability to permit an easy change in case obsolescence arise.

Company organisation and tools

Obsolescence Management requirements

The following list identifies just a few of the major contractual requirements recurring for the Obsolescence Management.

- (a) Suppliers (as Alenia) are responsible for management of all types of obsolescence in order to fulfil their contractual obligations vs the Purchaser.
- (b) Suppliers will make arrangements to ensure a common build standard is maintained throughout each production tranche in respect of obsolescence.
- (c) There will be a phase prior to the commencement of each production tranche to prepare for a common Build Standard for that tranche. This Build Standard shall be agreed with the Purchaser.
- (e) Interchangeability at module level shall be maintained throughout a production tranche, with no effect to the customer technical publications or in-service maintainability.
- (f) Any Customer/Purchaser change requests opportunity shall be taken to concurrently address any sensible and practicable associated obsolescence changes.

The above requirements are satisfied having a specific Parts Management System responsible of:

- 1) Removal of all existing and potential obsolescence prior to commencement of any Series Production.
- 2) Management of all further obsolescence occurring during Series Production

Contractual situations

Two different contractual situations are requested to Alenia Difesa to distinguish in order to manage, to discover and to monitor the surge of the obsolescence in any LRU design:

- *Existing Contracts*
- *New Contracts*

Existing Contracts

For the existing contracts is required to perform the following activities:

- a. To maintain the existing contract conditions and to acquire the components with the same Standard shown in the relevant Part List.
- b. To detect completely and exhaustively the components obsolescence at the initial stage of the design to avoid expensive redesign and re-qualification activities.
- c. To monitor correctly the Obsolescence taking into consideration all the available options in order to reduce the impact, saving time and costs.
- d. To take into consideration the impact of the quality level of the component selected during redesign and/or re-qualification activities if necessary

New Contracts

For the New Contracts is required to perform the activities covering the following aspects :

- a. Obsolescence Free Degree (Obsolescence tolerance)
- b. Quality Aspects
- c. Equipment Manufacturing Process (Process Control)

Summarising for the New Contracts is required to produce a Parts Management Plan, linked to the Obsolescence Management Plan which reflect the adopted policy to support the contractual requirements for the useful life of the equipment.

Alenia Organisation

The organisation, management and responsibility of the activities for the achievement of the Obsolescence Requirements is delegated to the Parts and Obsolescence Management Function inside of the Alenia RMT/LSA Department.

In particular the Obsolescence activities are managed and performed by the personnel of the above mentioned function with the co-operation of the Department involved in all the stage of project.

The engineers appointed to the Obsolescence tasks shall have access to the design data and drawings as required. They will be involved in the Project Design Review meetings as appropriate to cover the Obsolescence aspects and shall be informed of all proposed design changes.

The assessment regarding Obsolescence and Reliability implication shall be taken into account prior any decision on the implementation of design changes.

The Obsolescence Focal Point will interface with other disciplines correlated with LRI Project. Obsolescence information will be supplied to Reliability and Maintainability engineers for use in RMT and Logistic Support Analyses.

Close contact will be maintained with other Engineering disciplines (e.g. Design, Manufacturing, Purchasing) and Program Management to evaluate the impact of Obsolescence issues.

This Focal Point is responsible to co-ordinate all activities related to the Obsolescence within the Alenia Difesa and its Work-Share Partners.

An inter-disciplinary Obsolescence Work-Team is established.

The members of the team are members of all involved departments such as:

- Component Engineering
- Procurement
- Design Engineering
- Project Manager
- Manufacturing
- Program Manager

The Obsolescence Work-Team is responsible for fact finding and decision making in critical obsolescence situations.

Design criteria applied to minimise obsolescence impact

To minimise the impacts of the obsolescence, the following criteria shall be considered during design and development phase :

1. Emphasis shall be placed on the use of components for which multiple sources exist
2. Where possible all components shall be selected from preferred part list as Qualified Part List and Approved Component Database
3. Use of standard independent development environment

Solutions to deal with Identified Obsolescence

Depending on the on the LRIs “Obsolescence Health” the optimal strategies, recovery actions and solutions may differ.

Solutions may be classified as follows :

No.	Strategy	Description	Application
1	FFF equivalent	Replacement by a form, fit, function component	Multi source component, change to different source, no real obsolescence, problems may occur If the same quality level is unprocureable a substitution shall be activate.
2	Life Time Buy	All components for the series production programme (including spares and repair stock) will be purchased at the start of production	High risk is present when a single source supplier is considered in the relevant Part List (typical for ASICs and Hybrids). This solution is to be avoided when possible, it can be applicable when a specific batch of items are in production and their life cycle is well known and agreed.
3	Last Time Buy	Upon obsolescence notification by the supplier, a purchase of components is initiated to cover all future demand for the programme including spares and repairs.	This solution is applicable to a mature equipment and on isolated events only, but not for new design/re-design. It is also acceptable only if all obsolete components on a module can be removed by last time buys, otherwise a re-design shall be considered.
4	Substitution	Replacement by a part with acceptable non-compliance	This solution is applicable when no alternative components are present and a deviation can be accepted by the Customer/Purchaser. No re-design activities shall be considered.
5	After-market Supplier	Purchase from a Supplier who has purchased the rights and facilities to continue to manufacture the part from the original Manufacturer.	This is applicable to a mature equipment and on isolated events only, but not for new design/re-design.
6	Emulation / Cloning	FFF redesign of the obsolete component using current technology	This is applicable to the ASICs and other Custom designed components as Hybrids
7	Redesign	Re-design of the entire module to replace obsolete components with current technology. Major objective is to remove and avoid future obsolescence.	This is applicable when bulk obsolescence can be predicted or when at the beginning of a new tranche the rules are out of last time buys conditions
8	Inventory Survey	Use of internet tools (such as TACTech's Lo-K-tor) to locate components, which have become obsolete and which are for sale as excess inventory	This is applicable when the LRUs/SRUs are out of production but still in service (last phases of the life cycle of the equipment).

Obsolescence Activities prior the Series Production

The obsolescence activities to be performed prior to the Series Production shall be:

1. Obsolescence Survey
2. Status Assessment
3. Risk Analysis
4. Removal of Identified Obsolescence

Obsolescence Survey

Alenia Difesa maintain a Parts Management System which allows to identify, to report and to monitor the status of actual and potential obsolescence arisings.

The purpose of the Obsolescence Survey is to perform on each LRI the following activities :

- a) Active monitoring of component obsolescence status performed by the responsible organisational entity, according to a phase model, in order to identify components that are approaching the end of their life cycle.
The phase model classifies components according to their Life Cycle Code
- b) Assigning and updating the obsolescence status code to all components based on the monitoring described under a)
- c) Maintaining a stock management policy to decide on life time buy, last time buy and design-out point, involving consideration of costs, alternate sources, lead-time and buy opportunity.

- d) Planning of replacement/re-design activities including the assessment of alternative technical solutions and the associated risk. Sufficient buffer stock will be built up to avoid production schedules being compromised by re-design and qualification activities.

This activity includes notification to the Purchaser as well as to all Work-Share Partners involved.

Awareness of actual or impending obsolescence problems arises from a variety of sources.

These includes :

- Manufacturers and Suppliers Last Time Buy Notifications
- Direct inquiries at the Supplier/Manufacturer
- Manufacturers Web Sites by Internet Tools
- Notification by Consortium Partners
- TacTech Look-up tool and TACTRAC tool (in use in Alenia Difesa from the middle of 1999).

Inside of RMT/LSA Department, the Component Engineer will update quarterly the obsolescence status of all LRIs active components by using TACTRAC System and will communicate to the Project Manager and Project Leader the obsolescence status, alerts and obsolescence projections of the last design Components Part List.

The result of the obsolescence survey will be included on a Quarterly Obsolescence Report that, for each component used within the LRI, will report as a minimum the following information :

- a. Module Identification
- b. Alenia Difesa configuration part number (as foreseen by the internal Codification Specification System and Component Part List)
- c. Manufacturer commercial P/N
- d. Manufacturer Name
- e. Total quantity used on the SRU
- f. Life Cycle Code as foreseen by TACTRAC tool
- g. Component estimated years until unprocurable
- h. Component estimated years until obsolete
- i. Source of the information
- j. Sourcing Status
- k. Obsolescence Status Assessment
- l. Recommended replacement of the affected components including the availability of equivalent components and their specification

Status Assessment

Assessment of all components of the LRI to identify known and/or expected obsolescence during series production is performed.

Basing on criticality and expected consequences, all the obsolescence cases are classified into 4 groups as follows :

	<u>criticality</u>
1. Replacement available, same footprint	low
2. Replacement available, different footprint(new layout is required)	medium
3. No direct replacement available, different functionality <ul style="list-style-type: none"> • Design modification required • New layout • Software changes could be required 	high
4. No direct replacement available, process/technology obsolete (ASICs) <ul style="list-style-type: none"> • New component design • Module redesign • New layout • Software 	highest

This classification is used to indicate and track the obsolescence criticality and risk in the “Obsolescence Report” for any specific program.

Risk Analysis

There are several structured reports available on the TACTRAC Reports Menu that Alenia Difesa use to perform a Risk Analysis. They are :

- **System Life Cycle Matrix Report**
The Life Cycle Matrix report displays information that shows where the part(s) in the selected system scope falls into Average Life Cycle. When assessing the health of a system, looking at the parts that fall in the Introduction, Decline and Phase Out phases, these are the components with potential reliability or procurability problems that need solutions.
- **Source Depth by Product Type Report**
The Source Depth by product Type Report breaks out the selected scope by part family (Diode, Interface, etc.) and Manufacturer. For the family and each Manufacturer, the report shows how many parts of that family the Manufacturer can actively supply in the selected system scope, according to the approved family/recommended replacements. This report displays the number of parts available for each part type from the manufacturer indicating also which manufacturers you may be able to obtain better price from.
- **Potential Sourcing Issue**
The Potential Sourcing Issue Report displays all parts that currently have, or could shortly have, a problem with Manufacturer availability according to a specific selected filter.
The reports displays parts if they fall into any of the following categories according to the filter criteria:
 - **No Source- Obsolete** means the part and its recommended replacements have no active sources of supply
 - **No Source-Unprocurable** means the part has no active sources of supply but at least one of its replacement does have active source of supply
 - **Single Source-Unprocurable** means the parts has no active sources of supply and its replacements have only one active source of supply
 - **Single Source-Procurable** means the part has only a single source of supply
 - **Life Buy** means the part is under Life Time Buy status and will no longer be available in a short period of time
 - **Inactive for New Design** means the part has been determined by DSCC to not recommended for new design
- **Active Alternates List by Quality**
The Active Alternates List by Quality Report displays any active alternates from parts based on the filter for parts in the Selected System Scope broken down by Quality Level. With this report is possible to see which parts in the system have the most alternatives and how many alternatives exist at each Quality Level.
- **Active Alternates List**
The Active Alternates List Report displays the number of active and inactive alternatives for parts selected by system scope. To assess the health of the system, it is necessary to look at the usage in the system in relation to the number of active and inactive alternatives.

These reports are very useful in gauging any potential risk in supporting the System from an obsolescence and manufacturer availability standpoint.

Alenia Difesa uses these TACTRAC facilities to perform Risk Analysis for the LRIs.

Removal of Identified Obsolescence

All the identified obsolescence reported on the LRI Quarterly Obsolescence Report shall require a recovery action. The recovery actions may be several as follows:

a) Replace the obsolete component by replacement/redesign activities.

The replacement/redesign activities for replace obsolescent components shall maintain unchanged the original interface at LRU/SRU level in accordance with the interface specification.

For the above, the interchangeability at Form, Fit and Function (FFF) level of the previous version of SRU with the new version will be guaranteed.

The new component selection, selected to replace the obsolescent one, shall be determined taking into account the following characteristics:

- Clear technological longevity and maturity
- Multiple Sources
- Market position

When alternative components have been identified they will be included into Quarterly Obsolescence Report with the following information:

1. The commercial p/n and Manufacturer name.
When the alternative component is a multiple source, the commercial p/n and name of each Manufacturer shall be reported.
2. Which obsolete component will be replaced by the new one
3. The compatibility level respect the component to be replaced as:
 - Pin to Pin compatible
 - Function compatibility
 - Not full compatible

When not full compatible, the redesign at SRU level will be analysed in more details taking into account the practices to be adopted in using the new component and relevant technology.

This process captures the logic of Large Scale Integration microcircuits such as microprocessors, microcontrollers, arithmetic logic units, PALs, FPGAs, EPLDs etc. In that cases the Quarterly Obsolescence Report will be updated including all the components that have been impacted.

4. The impact on the qualification status of the LRI
5. The Status level of the new components including :
 - Multiple Sources
 - Technological maturity
 - Adequate Life Cycle Code

b) Provide a Last Time Buy action

When a Last Time Buy action is considered then the future requirements will be estimated and the total buy cost calculated. Holding costs will be included in the cost estimates. Since Last Time Buys are time limited the response time to implement will be the shortest and the relevant due date will be reported and timely controlled.

Where a Last Time Buys are employed, a procedure will be developed to control the long-term storage, life refresh and health of the component or die.

After that the latest date of the Last Time Buy has been verified, the quantity to supply will consider:

- The quantity to support the Production Investments (PI)
- The quantity to support the Series Production phase

c) Procure Obsolete Components

When a component have become obsolete, procurement of such part could be achieved by After-Marked Suppliers from stocks or other searching methods.

d) Life Time Buy of Critical components

For components which have been identified as being critical the following conditions shall be verified:

1. The latest date of the Last Time Buy
2. The quantity of components required to :
 - Support the Series Production
 - Support activities to protect the relevant LRI program

Documentation and Data Requirements List (DRL)

Design documentation and DRLs updating required as a result of re-design activities shall be defined in the respective EAPF.

Obsolescence Management during Series Production

Approaches

Reactive Approach

The reactive approach deals with obsolescence upon occurrence. It makes no specific provisions for obsolescence which may occur in the future. However, obsolescence may occur and will upon occurrence raise cost. This approach constitutes a high risk on the side of the Purchaser, because the impact of future obsolescence is not known and a budget cannot be set aside.

Proactive Approach

The Proactive approach is similar to an insurance policy and its objective is to reduce the costs in managing the LRI Unit. For the above Alenia Difesa offers insurance against obsolescence.

The Alenia Difesa Obsolescence Management is based on the proactive approach.

Alenia Difesa IQB0426 internal procedure defines the process and procedure which shall be used to monitor the obsolescence status.

The obsolescence activities to be performed during the specific LRI Series Production shall be:

- ⇒ Obsolescence Monitoring
- ⇒ Corrective Actions
- ⇒ Risk Analysis

Anticipated Extent of future Component Obsolescence

Assessment of the development phase results of the existing design identifies all components that are already obsolete or will become obsolete shortly.

A prediction of the non availability of components can only be based on known technology and market trends.

Such prediction of the "health status" are based on the Life Cycle Codes (LCCs) and relevant availability in terms of **"In Production"** or **"Not in Production"** data of components with respect to obsolescence.

These component LCCs are associated with the their anticipated family type life span.

As described in section 1.5 the LCCs are provided by the TACTRAC system of TACTech database.

This online and real time Obsolescence Management Tool provides on request a preview of the Health Status of an SRU such as a PCB for the life span of the LRI or any other time span.

Obsolescence Monitoring

If potential obsolescence becomes known fairly in advance, the necessary measures may be taken, and major problems can be avoided at an acceptable cost level.

The objective is therefore to conduct "Proactive Obsolescence Management" as opposed to "Reactive Obsolescence Management".

Obsolescence Monitoring activities shall be carried out during Series Production to establish the obsolescence status of the LRI and relevant SRUs.

In the following sections are described the facilities which will be used to perform this task.

TACTech Database

Tactech database provides information on the component status. The information consists on an indication of where the component function and related technology is in its lifecycle and what alternatives are available including information relevant to direct replacements down to commercial or industrial grade equivalents.

Commercial database

When a component has become obsolete and why it has become obsolete no consistent and complete database is available at Alenia Difesa. In these cases a lot of Commercial database on WEB Sites are available and consultable to determine the obsolescence status and availability of the component under analysis.

This kind of information will be managed and filed by the Obsolescence Focal Point within Alenia Difesa.

Manufacturer Notification

In most cases the obsolescence is detected when procurement is required. This occurs for those items purchased in small quantities from distributors and Alenia Difesa just receives a notification that the component in question will become obsolete and a Last Time Buy frequently is offered.

Alenia Difesa is strongly avoiding this kind of notification as a reactive approach sensitising continuously the Manufacturers in giving these information as a proactive approach.

However this kind of information will be managed and filed by the Obsolescence Focal Point within Alenia Difesa.

TACTRAC Tool

TACTRAC tool will be used during the LRI Series Production as a support tool for obsolescence management.

It is also noted, that various European Companies involved in EF2000 Programs have already subscribed to TACTRAC and are using the service successfully.

Alenia Difesa is using the TACTRAC tool (installed in April 1999). The system is based on a component data base which is kept current by the service provider.

The main TACTRAC features are:

- (1) **Constant electronic monitoring** of BoMs with real-time discontinuance notification. All areas of procurement vulnerability in a bill of material are automatically identified and prioritised. A full analysis of sourcing depth is provided and areas of sourcing vulnerability are identified. Furthermore the system provides immediate notification alerts on military microcircuit discontinuance and automatically notifies the user if any sourcing change occurs in the bill of material be it a new source or loss of a source.
- (2) **Automated real time electronic (living) library** of semiconductor availability
The component library provided contains virtually all known military microcircuits as well as their industrial and commercial grade equivalents. This library is constantly updated with information received directly from all QPL/QML manufacturers.
Detailed parametric data are available on all of the approximately 200.000 individual devices in TACTech database.
- (3) **Identification of critical items** such as LRUs, SRUs, ASICs and components driving obsolescence.
- (4) **Life Cycle modelling** at both the component and configuration level.
Preventive obsolescence management involves component selection and equipment level analysis, that takes into consideration component life cycles. Based on the technology attributes of the device being assessed, life cycles are calculated and maintained for each device in a "living library".
- (5) **Real time component procurability monitoring**
- (6) **Procurement problem identification** with solution alternatives.
- (7) **Automated data retrieval** and analysis techniques for determination of the best possible solution.
- (8) **Configuration management** flexibility to analyse a single SRU or to roll up multiple system or program combinations.
- (9) **Automatic Indenturing capability** to identify discontinuance impacts at the component, LRU and SRU.
- (10) **Cross reference** of all military microcircuits to industrial and commercial grade equivalents. All military semiconductor devices as well as all cross reference equivalents reside within the library. This allows to identify all FFF equivalent parts in descending order of quality.
- (11) **Parametric part search** capabilities
In selecting a device for a particular application, an appropriate part can be selected without knowledge of the manufacturer's part number. The system allows the user to identify the part by key parameters only for parametric searches. All parts meeting the input criteria are identified in complete technical detail inclusive of life cycles and sourcing availability.

(12) **Access to an electronic marketplace** for hard to find components

(13) **Data sharing** among linked users on corporate level (or within other structures) to enable co-ordinated decisions and cost sharing and to avoid task redundancy

Corrective Actions

The information obtained from Obsolescence Monitoring shall be used to perform the recovery actions to be reported in the updated Quarterly Obsolescence Report.

Conclusion

The basic ideas on the back of our pro-active approach are:

- ⇒ The products (in terms of equipment , subsystem or systems) design shall offers a flexible , open architerture which permits to change a specific functional block maintainig unchanged the overall architecture.
- ⇒ The Open architecture shall facilitate any design changes into the defined functional blocks (caused by obsolescence issues) because of the high level of interface standardization. The product design shall be so open and modular to permit changes and update with a reasonable level of risk and cost.
- ⇒ A product configuration for a pre-determined period of time shall be maintained by performing components buy (at least for the key components) for all expected production batches including logistic support, allowance and spares. During that period, the Customer shall be guaranteed by Alenia Difesa against any obsolescence issue by applying a “Last Time Buy per Batch” policy and equipment re-design, where necessary (minor changes due to “low critical level components” obsolescence).
- ⇒ There will be a periodic Product enhancement (Production Batch by Production Batch) which also permit a pre-planned obsolescence removal activities with relevant design changes.
- ⇒ There will be an high level of backward compatibility between the new , updated , system configuration and the previous one . The Customer is taken aware about any difference by using a very efficient and transparent configuration control system.
- ⇒ Technologies which support the Product enhancement will be consolidated and introduced at a point where the level of risk is considered acceptable or obsolescence became a major issue.
- ⇒ There will be a “synchronised technology insertion route” defined in the frame of the Company strategies which takes into account Customers requirement and market trend.
- ⇒ The problem of parts obsolescence can’t be solved as a one shot event . It’s control and management has to be considered as an essential requirement for an high quality product.
- ⇒ The obsolescence removal activity can’t be “just in case” but need to be anticipated and synchronized with a new technology insertion phase and or a step for a product enhancement.
- ⇒ There is an absolute need for a company organization capable of provide continuos market survey so that any corrective action can be taken on time for a minor changes or a major , synchronised product upgrade change.

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